

# IPv4 Module HDL Test Bench Instructions

## Requirements:

### Software:

- Vivado v. 2016.4
- File comparison tool (Windiff, Winmerge, fc.exe)

### Project Files:

- IP\_RX\_HDL\_Test\_Bench.xpr.zip
- IP\_TX\_HDL\_Test\_Bench.xpr.zip

## Inputs:

- IPv4\_Rx\_Test\_Suite.txt
  - Input file for all IPv4 receiver test cases
- IPv4\_Tx\_Test\_Suite.txt
  - Input file for all IPv4 transmitter test cases
- IPv4\_Rx\_Test\_Suite\_CORRECT.txt
  - Comparison file to determine pass/fail of simulation of IPv4 Receiver module
- IPv4\_Tx\_Test\_Suite\_CORRECT.txt
  - Comparison file to determine pass/fail of simulation of IPv4 Transmitter module

## Outputs:

**Note: All output files are in the current simulation folder (e.g. IP\_TX\_Test\_Bench\IP\_TX\_Test\_Bench.sim\sim\_1\synth\timing)**

- IPv4\_Rx\_Test\_Suite\_output.txt
  - Output file for comparison to determine pass/fail of simulation of IPv4 Receiver module
- IPv4\_Tx\_Test\_Suite\_output.txt
  - Output file for comparison to determine pass/fail of simulation of IPv4 Transmitter module
- [Test Bench Name]\_[simulation type].wdb
  - Saved waveform of simulation for reference

## Procedure:

### Setup:

1. Place "IP\_RX\_HDL\_Test\_Bench.xpr.zip" or "IP\_TX\_HDL\_Test\_Bench.xpr.zip" in appropriate sandbox area.
2. Extract project directory from .zip file utilizing your choice of compression software.
3. Open project file in Vivado 2016.4 by either double-clicking the project file or locating the Open Project prompt in Vivado and navigating to the project folder.

### IP\_RX Module Test Bench:

1. In the Flow Navigator panel choose Run Simulation.
  - a. To perform a behavioral simulation choose "Run Behavioral Simulation"
  - b. To perform a post synthesis functional simulation choose "Run Post-Synthesis Functional Simulation"
  - c. To perform a post synthesis timing simulation choose "Run Post-Synthesis Timing Simulation"

**Note: This test bench can only perform behavioral and post-synthesis simulations due to the inability to implement designs using File IO**
2. When the waveform simulation window appears in Vivado run the simulation for a further 85000 ns to ensure full test suite is run.
3. Perform analysis of results:
  - a. To determine if the output is correct run a file comparison with a difference check tool on the output file and the expected output "CORRECT" file. Both of these files can be found in the current simulation folder. There should be no differences for a passing result, differences regarding empty lines at the end of either file are acceptable.
  - b. To analyze the error checking review the wave form. The data\_out\_err line should be high during test cases 3 and 7.
    - i. To analyze the waveform after a simulation has been performed but the waveform window closed, in Vivado choose "Flow -> Open Static Simulation", locate the .wdb file in the simulation folder, then click and drag "IP\_RX\_TB\_POST\_SYNTH" from the Scope window to the Waveform window to see the waveforms.

### IP\_TX Module Test Bench:

1. In the Flow Navigator panel choose Run Simulation.
  - a. To perform a behavioral simulation choose "Run Behavioral Simulation"
  - b. To perform a post synthesis functional simulation choose "Run Post-Synthesis Functional Simulation"
  - c. To perform a post synthesis timing simulation choose "Run Post-Synthesis Timing Simulation"

**Note: This test bench can only perform behavioral and post-synthesis simulations due to the inability to implement designs using File IO**

**Note: It is highly recommended to view the previously run post-synthesis simulation per step 3.b.i due to a very long elaboration step that is possible.**
2. When the waveform simulation window appears in Vivado run the simulation for a further 85000 ns to ensure full test suite is run.
3. Perform analysis of results:
  - a. To determine if the output is correct run a file comparison with a difference check tool on the output file and the expected output "CORRECT" file. Both of these files can be found in the current simulation folder. There should be no differences for a passing result, differences regarding empty lines at the end of either file are acceptable.
  - b. To review the wave form:

- i. To analyze the waveform after a simulation has been performed but the waveform window closed, in Vivado choose "Flow -> Open Static Simulation", locate the .wdb file in the simulation folder, then click and drag "IP\_TX\_TB" from the Scope window to the Waveform window to see the waveforms.